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PLANS AND SPECIFICATIONS FOR:

FAMILY BLAST SHELTERS

(30 p.s.i.)



Canada

EMERGENCY MEASURES ORGANIZATION

(Supplement to Blueprint for Survival No. 6)

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EMO - BLAST SHELTERS SPECIFICATIONS - TYPE B

EXCAVATION AND BACKFILLING

General Conditions

The General Conditions are to be read with and form part of this specification.

Scope of Work

The work shall include clearing of the site, setting out the work, all excavation, backfilling and grading as shown on the drawings and hereinafter specified.

Setting Out of Work

The Contractor shall accurately set out the structure in the location shown on the site plan and shall establish all lines and levels. The Contractor shall supply all labour and material incidental for the erection of substantial batter boards and lines.

Excavation

The Contractor shall excavate for the structure to the depths as indicated on the drawings.

The Contractor must examine the site and determine the nature and extent of the materials that it will be necessary to remove to reach the depths shown on or required by the drawings.

If blasting is required it shall be done by a competent and fully experienced person and all precautions shall be taken to prevent damage to property or injury to life. The Contractor will be held solely responsible for accidents or injury to life and property.

The excavation shall be of sufficient size to facilitate the easy installation and removal of forms and inspection. The bottom of the excavation shall be level and free from all surplus material.

If it should prove necessary during the prosecution of the work to interrupt or obstruct the natural surface drainage or the flow of drains, the Contractor shall provide for same during the progress of the work in such a way that no damage shall result to either the Owner's property or adjacent property.

Water in Excavation

The Contractor shall provide and operate any pumping equipment necessary to keep the excavation free from water. Water pumped from the excavation shall be piped away from the excavation in such a manner as to cause no damage to the Owner's or adjoining properties.

Shoring and Bracing and Underpinning

When necessary the Contractor shall provide suitable and sufficient shoring and bracing to prevent the sides of the excavation from falling, slipping or caving in. The Contractor shall carry out any underpinning work required to prevent settlement or damage to any adjacent structures during construction of the shelter.

Backfilling and Grading

Backfill material may be unfrozen excavated, material providing it does not contain rock or boulders or a high clay content. Otherwise all backfilling shall be done using unfrozen sand fill.

All material shall be placed evenly about the structure in 8 inch layers, tamping each layer, by hand or machine, to within a distance of 4 feet of the structure and under slabs of any passageway which is not poured directly on undisturbed material.

The top 4 inches to bring the fill up to grade shall be topsoiled if stipulated elsewhere in the contract documents.

Upon completion of backfilling the site around and over the structure shall be graded and all surplus material removed from the site.

CONCRETE WORK

General Conditions

The General Conditions are to be read with and form part of this specification.

Scope of Work

The work shall include the furnishing of all labour, materials, equipment and operations required in the forming, handling, placement, finishing and protection of all concrete as shown on the drawings and specified herein.

Standard Specifications

The National Building Code of Canada 1953, Sections 4.1 and 4.2 shall govern all concrete work except where otherwise specified herein.

Wherever in these specifications methods of tests or standards are referred to the latest C.S.A. standards shall be used.

Materials

Unless otherwise noted, all material used in concrete work shall conform to the current Standard Specifications of the Canadian Standards Association covering respective materials suitable for the work.

- (a) **Cement**—All cement used shall be Portland Cement and shall comply with the requirements of C.S.A. Specification A-5 latest edition. Cement shall be delivered in suitable containers plainly marked with the brand or makers name. Cement in broken containers or in packages showing water marks shall not be used.
- (b) **Aggregates**—Concrete aggregates, both fine and coarse shall conform to C.S.A. specification A23-1942 articles 7-26 inclusive.
- (c) **Water**—Water for concrete shall be clean and free from an injurious amount of oil, acid, alkali, organic matter or other deleterious substances.
- (d) **Metal Reinforcement**—All reinforcing steel, not otherwise specified or shown shall be deformed bars of sizes, shop bent shapes and spacing noted. Steel shall be new billet stock of intermediate grade conforming to C.S.A. Specification G-30. Reinforcing bars shall be held securely in place at all bar intersections using No. 18 gauge annealed iron wire. All slab reinforcement shall be supported by metal chairs and spacers to ensure all steel will support the weight of workmen without displacement. All steel shall be in perfect condition, free from scale, rust or defects when installed and shall not be painted. A slight film of red rust shall not be considered objectionable. All reinforcing steel with the limits of a day's pour shall be placed and firmly wired before concreting starts.

Storage of Materials

Cement and aggregates shall be stored at the work in such a manner as to prevent deterioration or intrusion of foreign matter.

Mixing Concrete

Mix all concrete in a batch mixer of ample size.

The mixer shall insure a uniform distribution of the material throughout the mass and be equipped with a suitable charging hopper and a water measuring device which can be regulated and locked when a predetermined amount of water has been established for each mix.

All concrete shall be mixed for at least one and one-half minutes after all the materials are in the drum.

The entire contents of the drum shall be discharged before recharging.

Transit-mixed or ready-mixed concrete may be used if the requirements of the specifications are fully met, all operations are satisfactorily controlled, and the time for the adding of water to the pouring of concrete is such as to avoid any possibility of the mix beginning to set before it is placed. Measurement of materials, batching, mixing and delivering concrete shall be in accordance with A.S.T.M. C-94-54T.

Hand mixing shall not be allowed.

Strength of Concrete

The Contractor shall furnish a concrete which shall develop a compressive strength of 3000 psi at 28 days with a slump of not more than 4 inches.

Test Cylinders

At least four 6" x 12" concrete test cylinders shall be made by the Contractor from average concrete of each day's pouring. Cylinders shall be cured as follows: One (1) under job conditions; three (3) under laboratory conditions. Test one cylinder at 7 days and one cylinder at 28 days. Should the seven or twenty-eight day test fail to meet the design strength, test additional cylinders to verify results. Samples shall be properly labelled showing mix and location and date of pouring and shall be tested by an accredited laboratory. Contractor shall pay for all testing and submit reports of all tests to the Owner.

Forms

Construct wood forms of approved sound lumber or steel panels properly put together, secured against displacement, thoroughly clean all old form material before use.

Forms shall conform to shapes, lines and dimensions of members as shown on the drawings, and shall be assembled in a manner that will facilitate their removal without damage to the concrete.

For all exterior and interior exposed concrete work, the forms shall be built perfectly true and shall have smooth faces.

Take all possible care in the form work to produce surfaces free from projections, indentations, or other defects. Make joints in formwork tight to prevent leakage.

Form ties and spreaders shall be rod type that will either pull out or break off and leave no metal nearer than 1" from the surface and shall have no lugs, cones, washers or other device to act as spreaders within the form that will leave a hole larger than $\frac{3}{4}$ ", or a depression back of the exposed surface of the concrete; ties that are to be pulled shall be coated with approved graphite grease or other approved material to facilitate removal, care shall be taken to prevent spilling the concrete on exposed surfaces. Wire ties shall not be used.

Placing of Concrete

Before placing concrete, debris shall be removed from the spaces to be occupied by the concrete. Forms shall be thoroughly wetted or oiled (use approved oil in freezing weather). Reinforcement shall be thoroughly secured in position.

Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable in buggies or wheelbarrows, and by methods which shall prevent the separation or loss of the ingredients. It shall be deposited in the forms as nearly as practicable in its final position to avoid re-handling. It shall be so deposited as to maintain, until completion of the unit, a plastic surface approximately horizontal. Place all concrete within 30 minutes after mixing and under no circumstances use concrete that has partially hardened.

Concrete, during and immediately after depositing, shall be thoroughly compacted by means of mechanical vibrators supplemented by hand spading, rodding and tamping. The concrete shall be thoroughly worked around the reinforcement, around embedded fixtures, and into the corners of the forms.

Before depositing new concrete on or against concrete which has set, the forms shall be retightened, the surface of the set concrete shall be roughened, thoroughly cleaned of foreign matter and laitance and saturated with water, then the cleaned and saturated surfaces of the hardened concrete, shall be slushed with a coating of neat cement grout against which the new concrete shall be placed before the grout has attained its initial set.

Construction joints will be allowed only where shown on the drawings. To prevent laitance in horizontal joints, excess water shall be removed from the surface forming the joint after depositing the concrete. Surfaces of contact shall be cleaned, wetted, and given a coat of neat cement grout before depositing is resumed, and any laitance shall be removed. Mortises or keyways shall be formed in the concrete at all construction joints.

Protection and Curing

The concrete shall be protected from direct rain for a period of 1 day and from frost for seven days after pouring. The concrete shall be kept moist and if necessary, warm so that hydration of the cement can continue.

Concrete when deposited shall have a temperature of not less than 70 deg. Fahr. nor more than 100 deg. Fahr. In freezing weather suitable means shall be provided for maintaining the concrete at a temperature of at least 50 deg. Fahr. until the concrete has thoroughly hardened. Salt, chemicals or other foreign matter shall not be mixed with the concrete for the purpose of preventing freezing.

Building In Other Work

Make all necessary provisions in concrete work for other work installed by this or other contractors and build in any required dowels, ladder rungs, inserts, hangers, pipes, frames, etc., and all other work furnished by both the contractor or the owner.

Removal of Forms

Leave forms and shores in place until it is safe to remove them. The Contractor shall assume all responsibility in this connection. Forms shall be removed taking care to prevent chipping of edges of concrete. Reshore the roof slabs during filling operations and until the concrete has had sufficient time to attain its specified strength.

Alkali Attack

Precautions shall be taken to provide concrete that will resist deterioration by alkali. Contractor shall thoroughly acquaint himself with concrete practice in the area and if the soil, ground water or aggregates to be used contain alkali in harmful quantities the following requirements shall be met.

Cement used shall be alkali-sulphate resisting cement conforming to C.S.A. Specification A5. The strength of concrete shall be increased to 3500 psi at 28 days and not less than 7 - 87½ lb. sacks shall be used per cubic yard of concrete.

Breaking and Making Good

Where shelter structure is to be attached to house this Contractor shall break through basement wall, form and pour concrete door lintel as shown and finish opening true and square to size shown on drawings or described in the contract documents.

Finishing

Chip off and grind all fins and uneven patches on all exposed concrete work to provide a smooth and even surface. Plug all holes left by removal of ties with a mix resembling the original concrete.

All exposed horizontal surfaces shall have a wood float or steel trowel finish as required by the owner. The floor shall be slightly sloped to the sump wherever a sump is installed.

WATERPROOFING

General Conditions

The General Conditions are to be read with and form a part of this specification.

Work Included

This work shall include the supply and installation of all waterproofing membranes as required by site conditions. If water table is below the floor level of shelter, membrane required on roof only, if water table above the floor level complete membrane required on roof and walls and below floor. The waterproofing of any passageway shall be the same as for the shelter and shall continue onto the basement walls to seal the joint.

Materials

Coal tar pitch, asphaltic compounds, saturated roofing felt or fabric or $\frac{1}{8}$ " premoulded asphalt used in membrane construction or waterproofing shall comply with C.S.A. specifications applicable.

Application

The application of the material shall comply with the manufacturers instructions. Best trade practices shall be used where instructions are lacking.

CARPENTRY

General Conditions

The General Conditions are to be read with and form part of this specification.

Scope of Work

This work includes the metal covered and flashed top hatch of the emergency exit, the door or hatch at the entrance to the shelter (not the blast door) complete with hardware satisfactory to the owner, all shelving, cupboards, bunk bed framing, etc., required by the contract documents; complete with suitable hardware.

Materials

All lumber shall be new, dressed, air dried to a moisture content of not more than 15% and free of shakes, decay and unsound knots. It shall be of a type used locally for finished carpentry in good practice.

The plywood used shall be capable of withstanding severe moisture exposure conditions.

Workmanship

Qualified workmen shall be employed to do the work and it shall be done in accordance with good trade practices.

Backpriming

Backprime all faces of wood set against concrete or masonry with copper napthanate or other wood preservative.

MISCELLANEOUS METALWORK

General Conditions

The General Conditions are to be read with and form part of this specification.

Scope of Work

This work includes the supply and installation of; blast door and frame complete with all hardware, the lower hatch and frame of the emergency exit complete with adjustable post jack (12 ton rated capacity), and all miscellaneous anchor bolts and ladder rungs required.

Materials

The following requirements in regard to materials shall govern the work except as specified or noted on the drawings to the contrary.

Mild Steel—Steel shapes and plates shall be medium open hearth steel with all surfaces free from abnormal irregularities or imperfections. Mill scale shall be removed by sand blasting.

Fabrication

- (a) Fabrication of miscellaneous metalwork shall conform to best practice. Work shall be true, square and carefully and rigidly assembled.
- (b) Welding shall conform to the C.S.A. specification '59 latest edition.
- (c) All iron work shall be thoroughly cleaned and all scale, rust and dirt removed with a stiff wire brush and painted one coat of red lead and linseed oil paint.

Setting

This work shall be delivered complete and securely anchored to the work as shown on the drawings. Where the work is to be built into the concrete supply to concrete contractor for setting; (Steel door frame and blast door of type required, emergency exit hatch and frame where required, all miscellaneous anchors, bolts and ladder rungs).

MECHANICAL WORK

General Conditions

The General Conditions are to be read with and form part of this specification.

Scope of Work

The work under this section includes:

- (a) Supply and installation of ventilation system.
- (b) Water storage tanks and connecting piping.
- (c) Electrical outlets and connection to house wiring.
- (d) Air regeneration canisters.
- (e) Fuel storage tank in Group Shelter.

Piping, Ducts and Fittings

Ventilating piping and ducts for air supply or exhaust shall be schedule 40 steel pipe and 26 gauge galvanized sheet steel duct as shown on the drawings.

Water piping to storage tank shall be type K soft drawn copper tubing with solder type copper fittings. Joints between steel pipe and galvanized sheet ducts shall be made as detailed on the drawings. Joints in water piping shall be made with 50-50 type solder. Screwed joints in ventilating pipes shall be made with accurately cut taper threads and pipe thread compound.

Supply and install with duct work tight fitting sheet metal caps for tee connections. Duct dampers shall be installed where noted and shall be accurately made to completely shut-off duct and shall have external indicating and locking device.

Supply with each shelter, except above ground type, a three foot length of flexible duct 3 inch diameter for family shelter and 4 inch diameter for group shelter complete with two hose clamps. Flexible duct shall consist of an electro galvanized flat steel spiral with a 14 oz. high temperature type vinyl organson bonded to glass fabric crimped to spiral. This duct shall be capable of connecting the filter by pass to the T section above the blower.

Supply and install in each shelter an exhaust hood over cooking table. Hood shall be constructed of galvanized sheet steel 22 m.s. gauge as detailed on the drawings.

Valves

Supply and install shut-off and drain valves on the water system and storage tanks. Shut-off valves shall be solder joint type brass globe pattern with composition disc and rated for 100 psi working pressure. Drain valve on tank shall be brass sediment faucet with hose end outlet.

Anti-Blast Valves

Supply and install anti-blast valves as shown on drawings. Valves are only required on inlet ventilating pipe for the 10 psi shelters and on the inlet and outlet pipes for the 30 psi shelters.

Valves shall be 125 lb. class screwed pattern cast iron body, brass trimmed vertical lift check valves.

These valves shall be installed with the normal valve inlet attached to the ventilating pipe and the normal outlet open to atmosphere. The valves shall be installed in the vertical position as shown on the drawings.

Air Filters

Supply and install in frame or enclosure as detailed on the drawings air filters of the sizes noted.

Filters shall be of a type having an efficiency of 95% on 5 micron size particles at the rated air capacity.

Filters shall have $\frac{3}{4}$ " exterior plywood frame glass asbestos media with aluminum separators and rubber base sealer. A $\frac{1}{4}$ " thick sponge rubber gasket shall be fitted on filter frames as noted on the drawings.

Air Regeneration System

Supply with each ventilating fan an air regeneration canister to contain dioxide absorbent. Canisters shall be constructed as detailed on the drawings from galvanized sheet steel with soldered joints and with galvanized wire screening.

Supply with family and group shelters respectively 15 and 75 pounds of Soda-lime ("Cardoxide" or "Soda-sorb") in 4 to 8 mesh size granular form. Soda-lime shall be supplied in metal containers with tight fitting covers. Soda lime shall have indicator that will turn from white to blue on change from sodium hydroxiate to sodium carbonate.

Supply complete with primer and starting caps, chlorate candles 10 in. long by $4\frac{3}{4}$ in. diameter for oxygen production. Supply with family shelter one candle and for group shelter three candles.

Ventilating Fans

Supply and install where shown on drawings hand powered type radi blade ventilating fans.

Fans shall be complete with pedestal type base, oil immersed totally enclosed gear train and crank with handle.

Fan capacities shall be as follows:

- (a) *Family Shelter*—Size No. 1 (one required) 50 cubic feet per minute, against a resistance of one inch water gauge with a crank speed of 37 to 40 revolutions per minute.
- (b) *Group Shelter*—Size No. 3 (two required) 200 cubic feet per minute against a resistance of two inches water gauge with a crank speed of 38 revolutions per minute.

Water Storage Tanks

(a) *Family Shelter*—Supply and install where shown on drawings a 24 inch diameter by 60 inch high galvanized steel water storage tank complete with stand and all tappings as shown on drawings. Tank shall be equipped with a 500 watt immersion heater controlled by a strap-on type surface thermostat. Tank shall be insulated with a three-ply corrugated asbestos insulating jacket held in place with steel straps.

(b) *Group Type Shelter*—Supply and install where shown on drawing two standard oval type tanks for water storage. Tanks shall have capacities of 200 and 250 imperial gallons as noted. Tanks shall be made of 14 gauge steel of all welded construction and galvanized. Tanks shall be complete with welded legs level indicators and all tappings as shown on drawings. Each tank shall be equipped with 500 watt immersion heater controlled by a strap-on type surface thermostat. Each tank shall be insulated with one inch thickness of glass fibre insulation held in place with wire ties and with joints sealed with glass fibre cement.

Fuel Storage Tank

Supply and install for group shelter where shown on drawings a standard oval type tank for kerosene storage. Tank shall have a capacity of 100 imperial gallons. Tank shall be constructed of 16 gauge steel of all welded construction complete with welded legs level indicator and all tappings as indicated on drawings. Tank shall have coat of primer on exterior and interior of tank preserved with rust inhibitor.

Commode Stand

For group shelters supply and install, where shown on the drawings, an airtight sheet metal commode stand with tight fitting formed wooden toilet seat and cover complete with hinges. It shall be rigidly secured to the floor with a flanged connection on the outside of the stand. The stand shall be easily removed to allow Chloride of lime to be distributed in the tank.

Electrical Work

Supply and install in shelter where shown on drawings a porcelain lamp holder with receptacle. Supply and install all wiring from house basement circuit or main distribution panel to lamp receptacle and immersion heaters.

All underground wiring shall be No. 12B \times L and all wiring within house and shelter shall be No. 12 non metallic sheath cable.

All wiring shall be done in accordance with local applicable regulations and codes.

Supply and install the following rechargeable battery type emergency lights.

- (a) *Family Shelter*: Portable type with 25 watt sealed beam lamp lead acid wet cell battery less built-in charger.

(b) **Group Shelter:** Shelf mounted type with two 25 watt sealed beam lamps, 100 amp hour lead acid battery, built-in automatic charger and panel mounted controls.

Supply and install complete with terminal mounting posts a radio antenna as detailed on the drawings.

OPERATING THE SHELTER VENTILATING EQUIPMENT

Before an attack actually occurs the shelter ventilation system can be operated in the normal manner with exhaust and inlet duct dampers open and the tee caps in place. The fan or fans in the case of the group shelter will supply sufficient fresh air based on 50 to 75 percent operation depending upon the degree of activity of the shelter personnel and their ages. The fan or fans should be operated for a 15 minute period then a rest of 5 to 15 minutes. A regular schedule of operators for the fans should be organized and carried out in such a manner so as to minimize physical activity. All physical activity within the shelter should be kept to a minimum especially during the time the shelter ventilating system is closed down during regeneration period.

After the attack and blast occurs it is most likely that numerous large fires will be started in the vicinity of the shelter. In order to prevent carbon monoxide from these fires entering the shelter it will be necessary to shut off the main dampers in the inlet and outlet ventilating ducts.

The volume of the shelters is such that with the rated number of occupants (i.e. six in the family shelter and thirty in the group shelter) the ventilation system may be shut down for three hours with no ill effects on the occupants.

If the shelter is located in a densely built up area it will be necessary to have the shelter ventilating system closed to the outside atmosphere for a period of up to six hours. For the remaining three hours the air regeneration system will be required.

The operation of the regeneration system is as follows:

- (a) Dampers in inlet and outlet ducts to atmosphere to be closed.
- (b) Remove cap on tee in inlet ducts.
- (c) Fill regeneration canister with soda-lime granules. (Do not pack too tightly) and fasten canister to fan outlet with hose clamp.
- (d) Operate fan in normal manner (15 minute operation 5 to 15 minute rest).
- (e) Colour of soda-lime in canister should be checked periodically (When colour completely changed to blue the soda-lime is exhausted and should be replaced).
- (f) For oxygen production the chlorate candle should be used. The candle need only be used for approximately 30 minutes.

Group Shelter

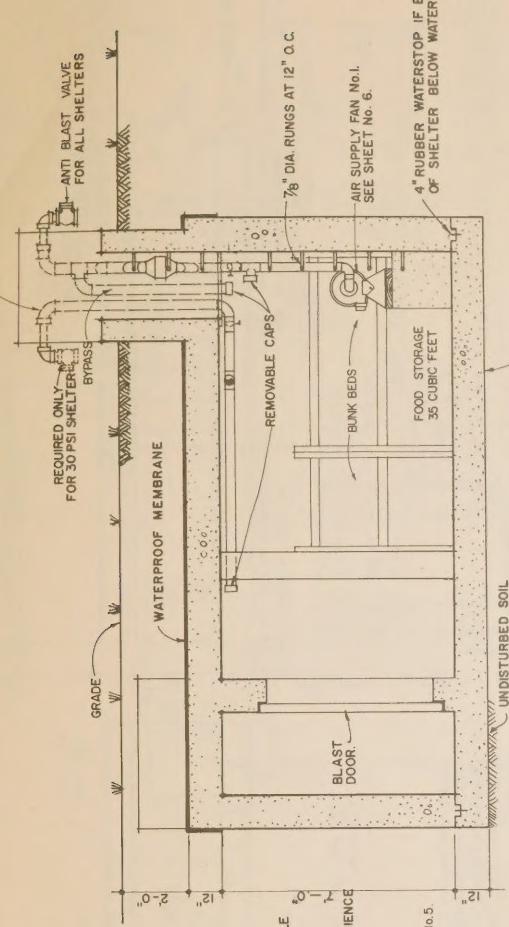
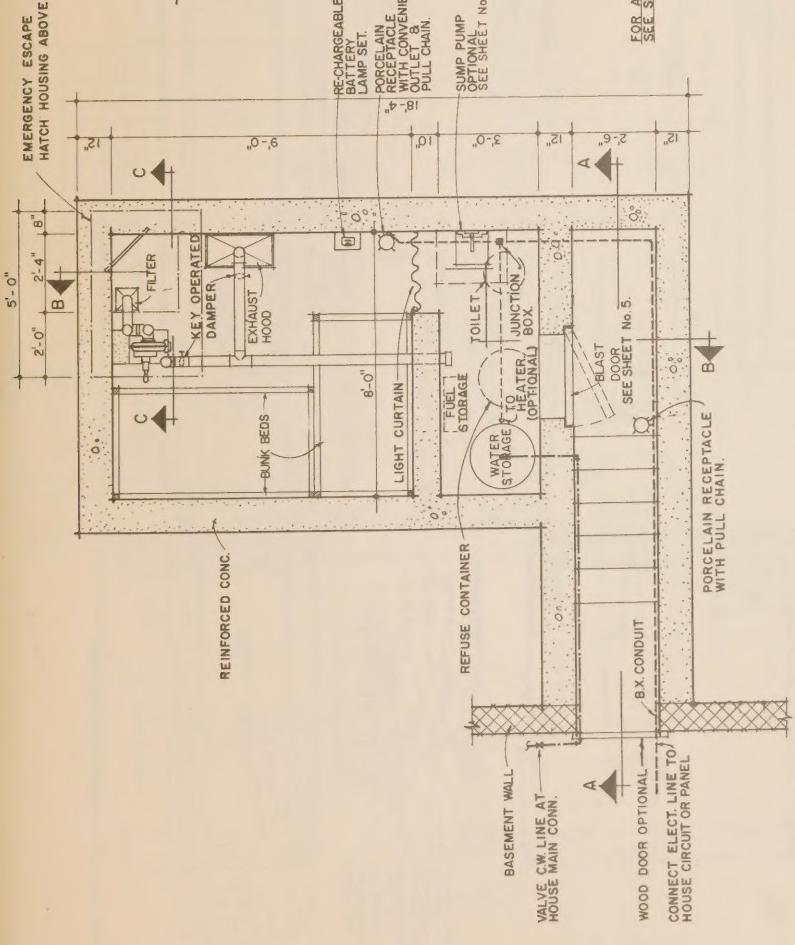
- (a) Dampers in both inlet ducts and in outlet duct to atmosphere to be closed.
- (b) Remove caps on tees in both inlet ducts.
- (c) Fill regeneration canisters with soda-lime granules (do not pack too tightly), and fasten canisters to fan outlets with bolts on flanges.
- (d) Operate fans in normal manner (15 minute operation 5 to 15 minute rest).
- (e) Colour of soda-lime in canister should be checked periodically (When colour is completely changed to blue the soda-lime is exhausted and should be replaced.)
- (f) For oxygen production two chlorate candles should be used. Both candles should be used until depleted, which takes approximately one hour.

At the end of the approximate six hour closed in period the shelter ventilation system can again be opened to atmosphere as follows:

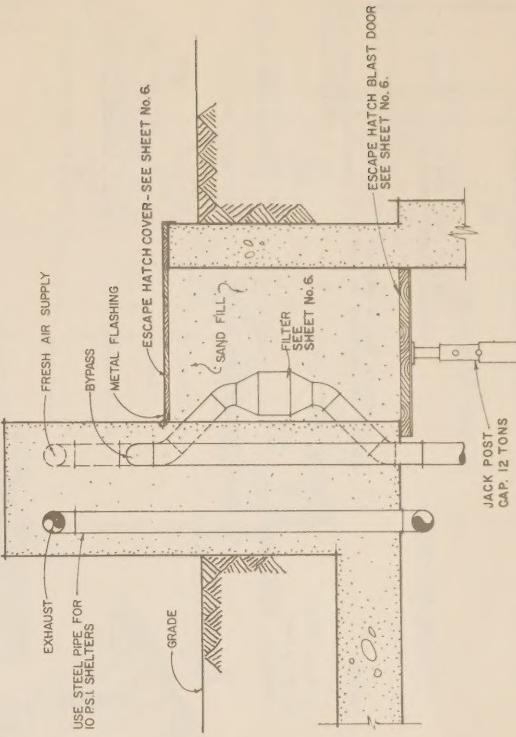
- (a) Remove regeneration canisters.
- (b) Fit caps on open tees.
- (c) Open dampers on inlet and exhaust ducts to atmosphere.

Filter Trouble

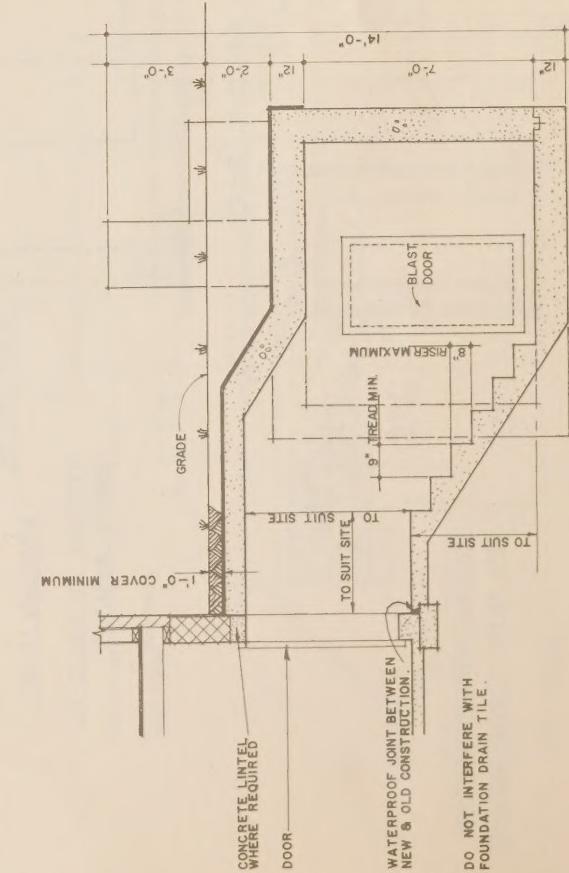
There is a remote possibility that the filter will become plugged with soot and dust. If this happens the blower will supply very little air. If the air supply is insufficient, then and only then, use the loose flexible duct to connect the filter by-pass to the T section above the blower. In the cases where the filters are built into the wall and no by-pass is provided the filter should be removed, wrapped up and placed by the blast door as quickly as possible. The steel plate must be reinstalled over the opening.

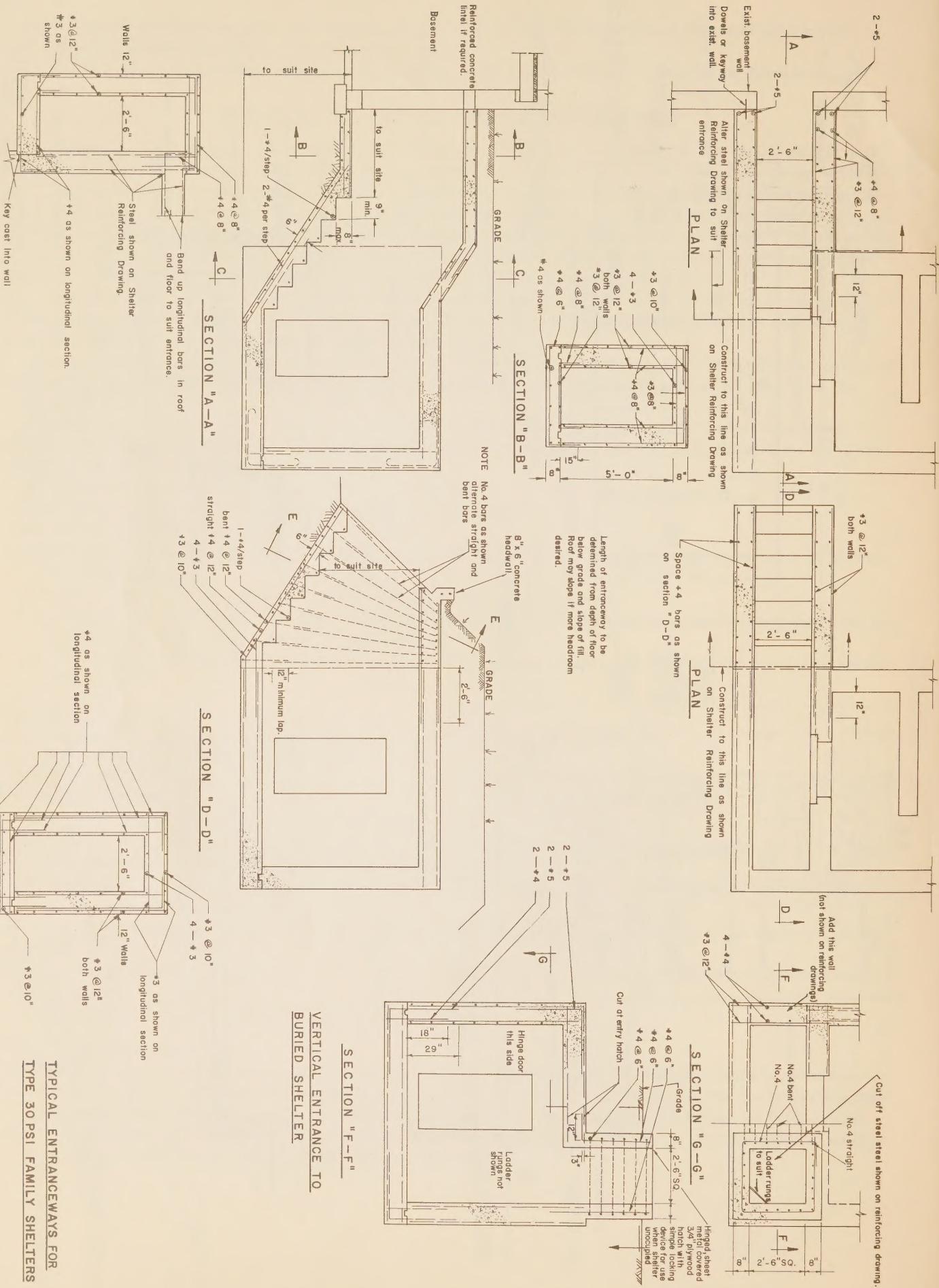


2 PLY HOT APPLIED WATERPROOF MEMBRANE OR
1/8 PREMOULDED GASHALT MEMBRANE IF NORMAL
WATER TABLE IS ABOVE FLOOR LINE.

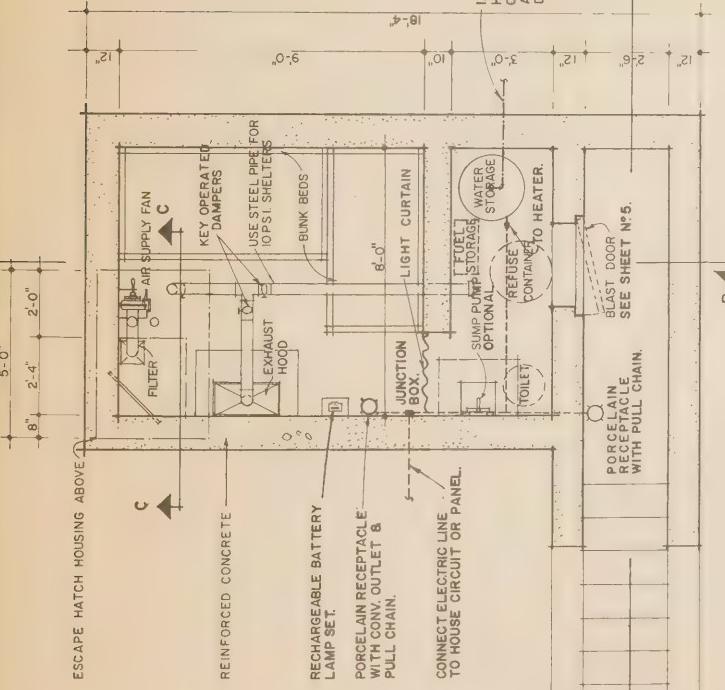


SECTION C - C
SCALE $\frac{3}{4}'' = 1'-0''$ BEING
GRADE FAMILY SHELTER
SHOWING ENTRANCE THROUGH BASEMENT
TYPE - 10PSI & 30PSI





B



A

B

SECTION B-B

FOR ALTERNATIVE ENTRANCES
SEE SHEET TS 2 AND 2B.
SHELTER LAYOUT MAY BE
REVERSED AS SHOWN ON
BELOW GRADE LAYOUT DRAWING.

2 PLY HOT APPLIED WATERPROOF MEMBRANE OR
1/8" PREMOULDED ASPHALT MEMBRANE

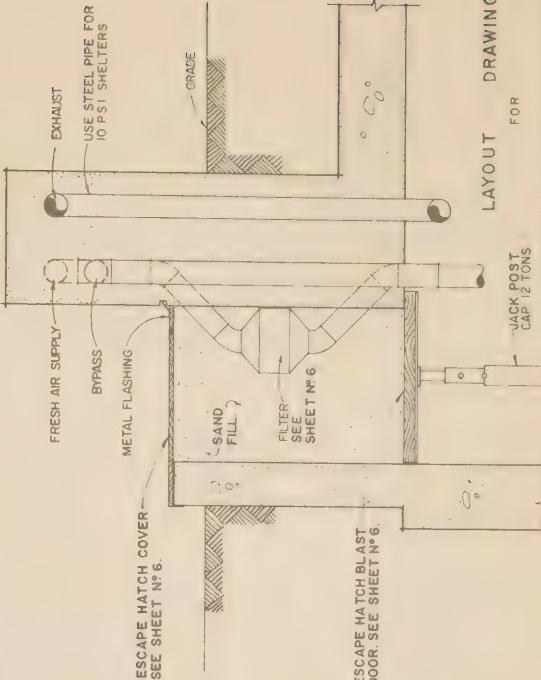
EARTH FILL
7 1/2" DIA RINGS ON
12 OC.
EXISTING GRADE

AIR SUPPLY FAN
SEE SHEET N°6.

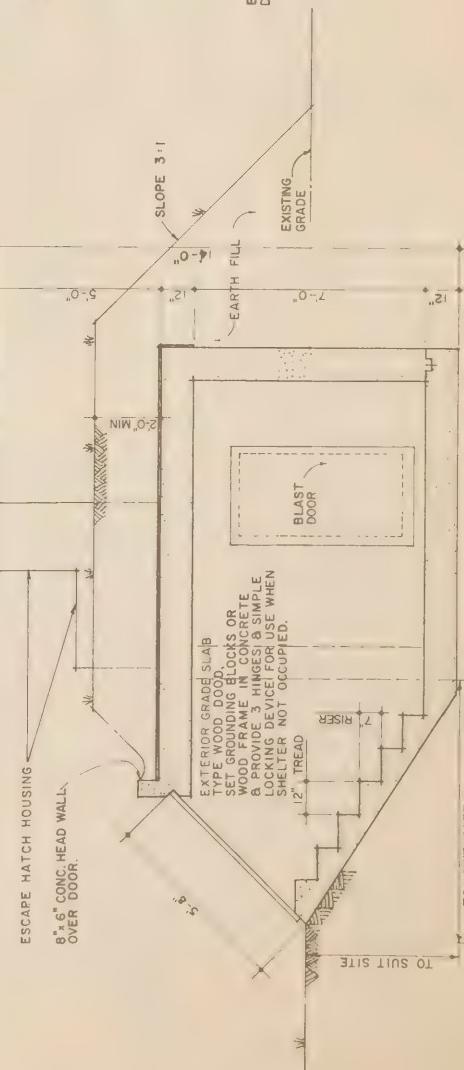
-4" RUBBER WATERSTOP
IF BASE OF SHELTER
BELOW WATER TABLE.

UNDISTURBED SOIL

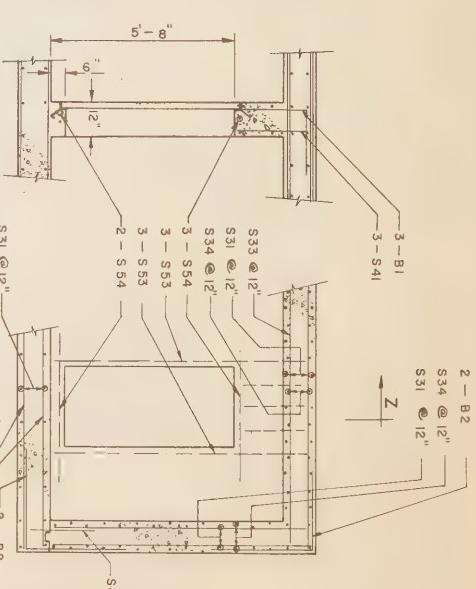
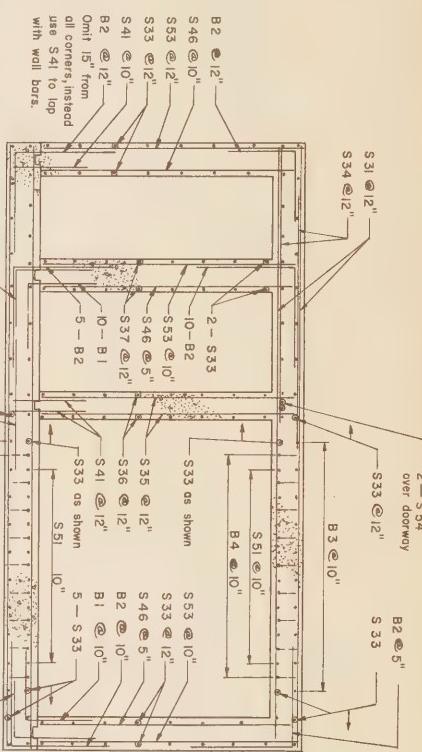
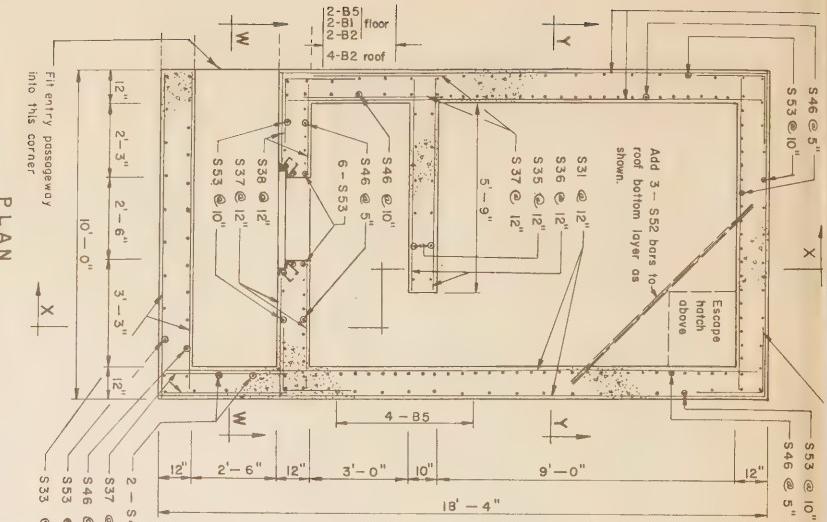
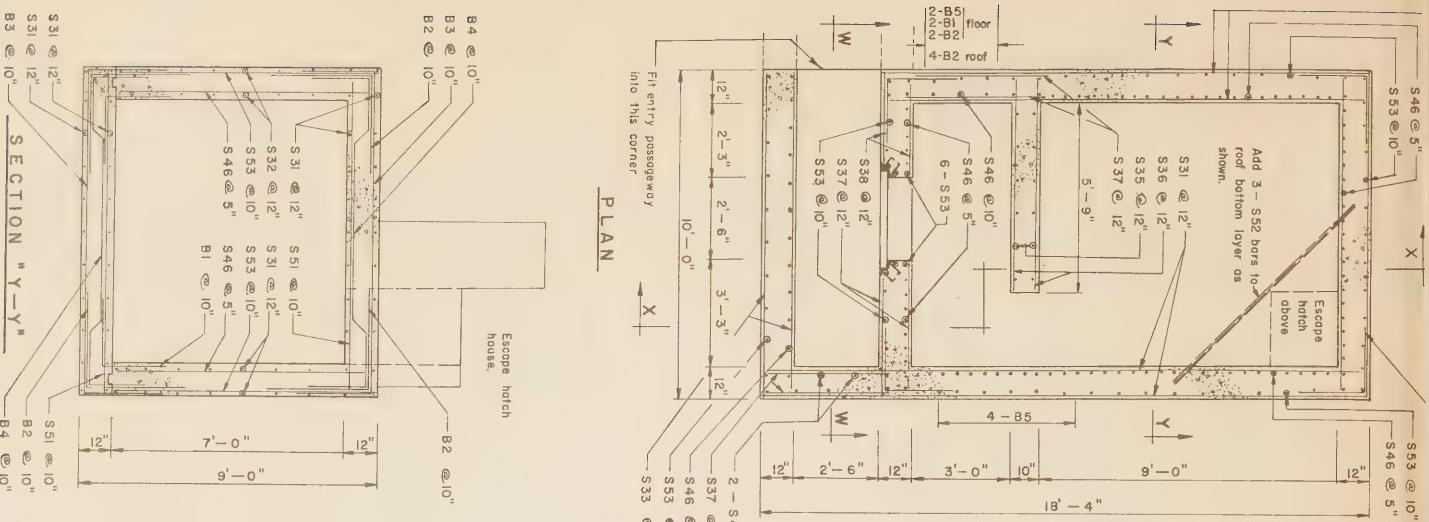
SECTION B-B



SECTION A-A



SECTION C-C



REINFORCING DRAWING

BELLOW & PARTIALLY BELOW GRADE FAMILY SHELTER
TYPE - 30^{PSI}.
USE TYPE - 30 BLAST DOOR.
SHEET NO. 2B.

REINFORCING BAR SCHEDULE

| Location | Marks | Size | Length | No. lead | Comments |
|----------|-------|------|--------|----------|----------|
| F, W, R | S31 | #3 | 18'-0" | 58 | |
| W, R | S32 | #3 | 14'-6" | 14 | |
| F, W, R | S33 | #3 | 9'-6" | 80 | |
| R, W | S34 | #3 | 8'-3" | 14 | |
| W | S35 | #3 | 7'-9" | 12 | |
| W | S36 | #3 | 6'-3" | 16 | |
| F, W | S37 | #3 | 4'-0" | 46 | |
| W | S38 | #3 | 3'-0" | 12 | |

Location:

F = floor

W = walls

R = roof

E = escape hatch housing

Marks:

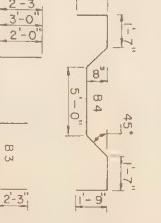
for straight bars

S — indicates straight bar

First number — gives size

Second number — gives length

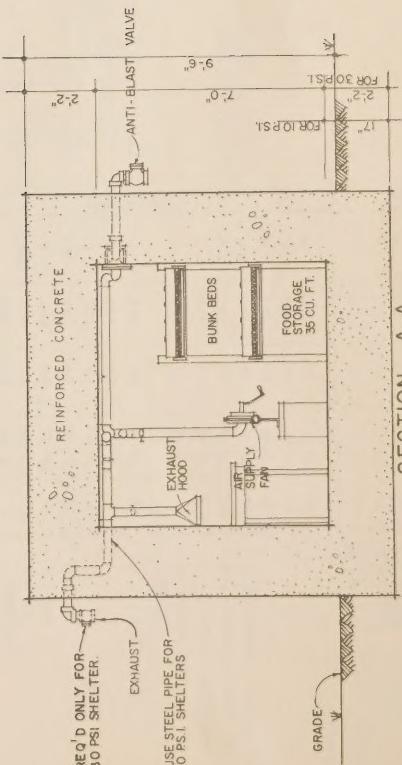
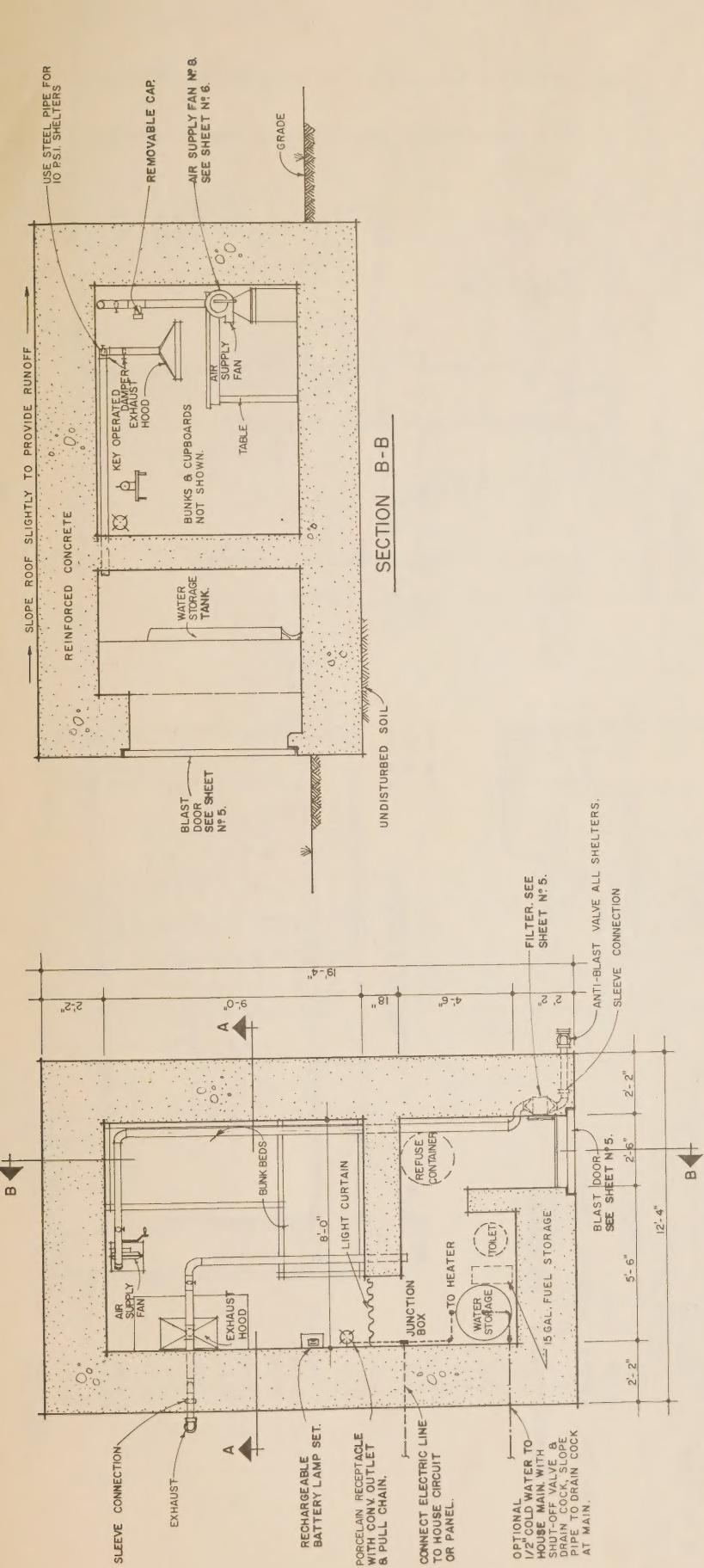
| bent bars | straight bars | bars |
|-----------|---------------|------|
| R, F | S51 | #5 |
| R | S52 | #5 |
| W | S53 | #5 |
| W, R | S54 | #5 |
| F, R | B1 | *4 |
| F, R | B2 | *5 |
| F, R | B3 | *5 |
| F | B4 | *5 |
| F | B5 | *7 |
| F | B6 | *4 |
| E | B7 | *4 |
| E | B8 | *4 |
| E | B9 | *4 |

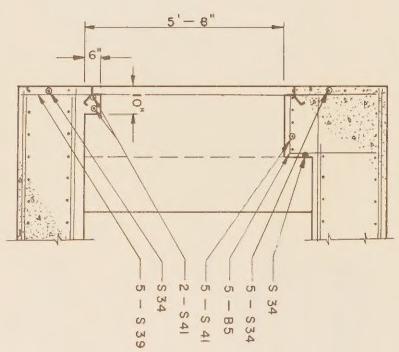
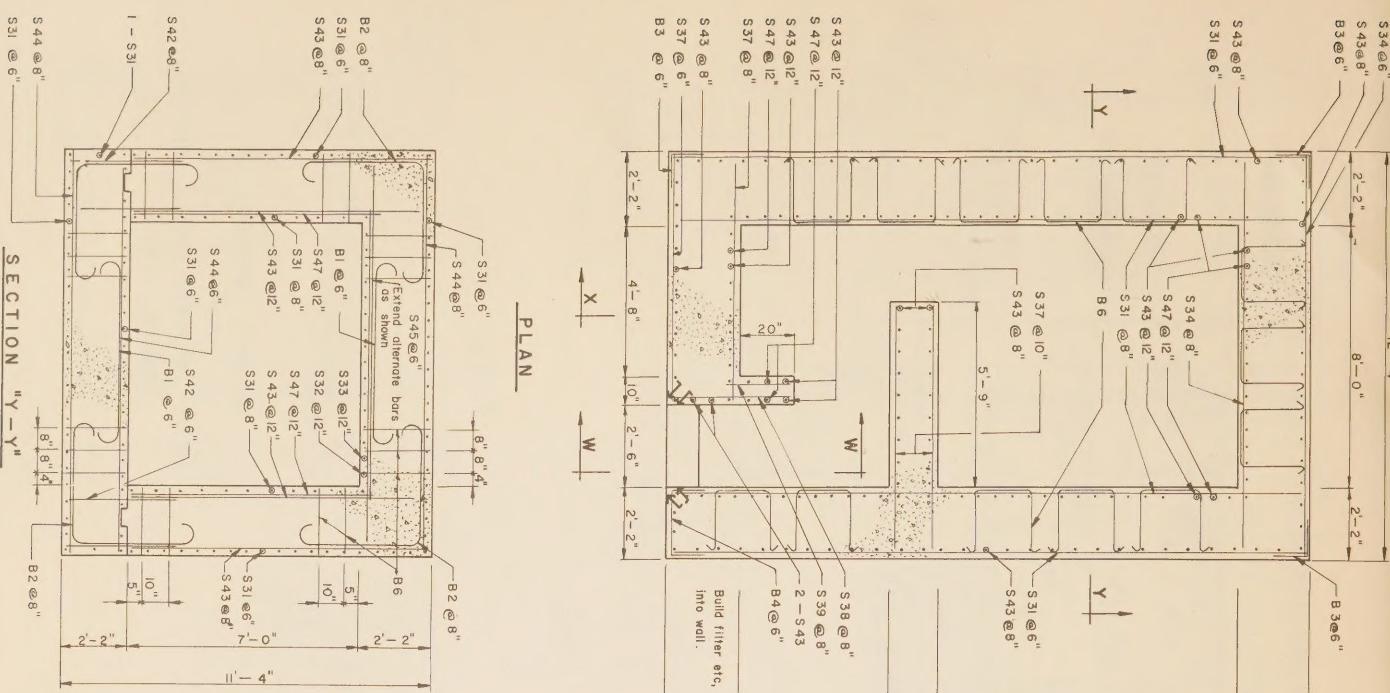


SECTION "Y-Y"
S31 @ 12"
S32 @ 12"
S33 @ 12"
S34 @ 12"
S35 @ 12"
S36 @ 12"
S37 @ 12"
S38 @ 12"
S39 @ 12"
S40 @ 12"
S41 @ 12"
S42 @ 12"
S43 @ 6"
S44 @ 6"
S51 @ 10"
S52 @ 10"
S53 @ 10"
S54 @ 10"
S55 @ 10"
S56 @ 10"
S57 @ 10"
S58 @ 10"
S59 @ 10"
S60 @ 10"
S61 @ 10"
S62 @ 10"
S63 @ 10"
S64 @ 10"
S65 @ 10"
S66 @ 10"
S67 @ 10"
S68 @ 10"
S69 @ 10"
S70 @ 10"
S71 @ 10"
S72 @ 10"
S73 @ 10"
S74 @ 10"
S75 @ 10"
S76 @ 10"
S77 @ 10"
S78 @ 10"
S79 @ 10"
S80 @ 10"
S81 @ 10"
S82 @ 10"
S83 @ 10"
S84 @ 10"
S85 @ 10"
S86 @ 10"
S87 @ 10"
S88 @ 10"
S89 @ 10"
S90 @ 10"
S91 @ 10"
S92 @ 10"
S93 @ 10"
S94 @ 10"
S95 @ 10"
S96 @ 10"
S97 @ 10"
S98 @ 10"
S99 @ 10"
S100 @ 10"

DETAIL OF ESCAPE HATCH HOUSING

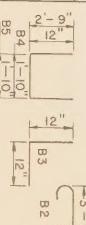
LAYOUT DRAWING FOR ABOVE GROUND FAMILY SHELTER TYPE - 10_{PSI} & 30_{PSI}

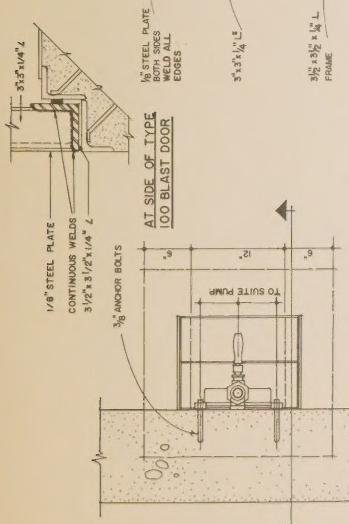




SHEET No. 3B.

REINFORCING BAR SCHEDULE

| REINFORCING BAR SCHEDULE | | | | | |
|--------------------------|-------|------|--------|------------|---|
| Location | Marks | Size | Length | No. req'd. | Comments |
| F, W, R | S 31 | * 3 | 19'-0" | 134 | |
| R | S 32 | * 3 | 17'-3" | 9 | |
| F, W, R | S 33 | * 3 | 15'-3" | 8 | |
| R | S 34 | * 3 | 12'-0" | 82 | |
| F, R | S 35 | * 3 | 10'-6" | 10 | F = floor |
| W | S 36 | * 3 | 8'-0" | 22 | W = walls |
| W | S 37 | * 3 | 7'-3" | 42 | R = roof |
| W | S 38 | * 3 | 3'-6" | 11 | |
| W | S 39 | * 3 | 2'-0" | 16 | |
| | | | | | |
| | | | | | <u>Marks:</u> |
| | | | | | for straight bars |
| | | | | | S — indicates straight bar |
| | | | | | First number — gives size |
| | | | | | Second number — gives length |
| bent bars | | | | | |
| F, R | B 1 | * 5 | 6'-8" | 30 | |
| F, R | B 2 | * 8 | 9'-6" | 114 | |
| W | B 3 | * 3 | 2'-0" | 59 | |
| W | B 4 | * 3 | 3'-10" | 13 | |
| W | B 5 | * 3 | 7'-4" | 5 | |
| F, W, R | B 6 | * 4 | 8'-0" | 88 | |
| | | | | | |
| | | | | |  |

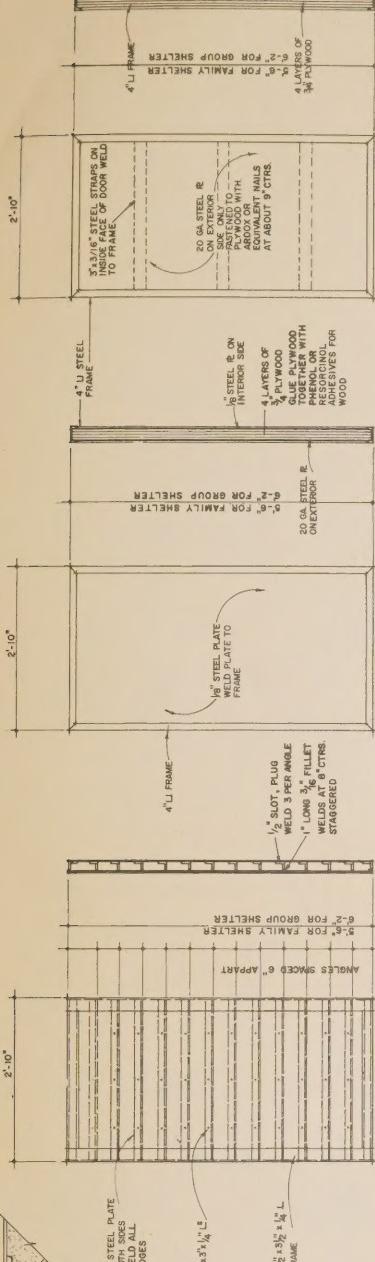


TYPE 100 BLAST DOOR

SCALE $\frac{1}{4}$ " = 1'-0"
USE IN 100 PSI SHELTERS WHEN INSTALLED
IN VERTICAL POSITION.

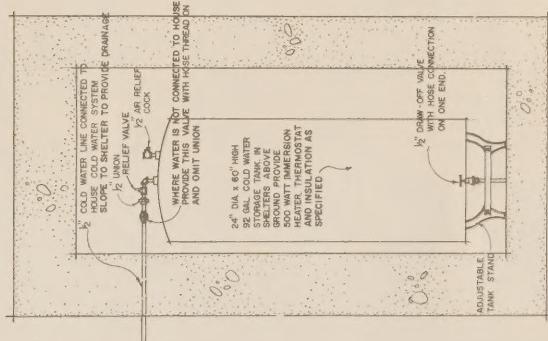
TYPE 30 BLAST DOOR

SCALE $\frac{1}{4}$ " = 1'-0"
USE ON 10 PSI SHELTERS WHEN INSTALLED
IN VERTICAL POSITION OR AT LESS THAN 45° TO HORIZONTAL.



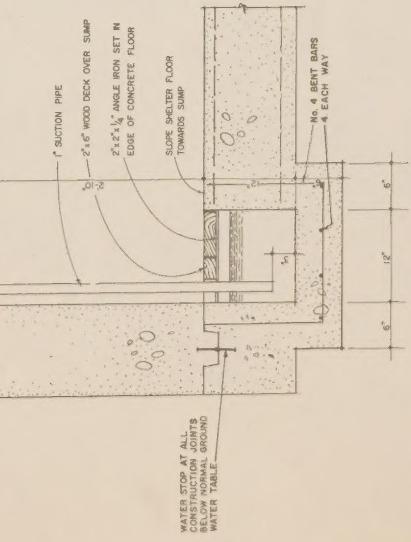
TYPE 10 BLAST DOOR

SCALE $\frac{1}{4}$ " = 1'-0"
USE ON 10 PSI SHELTERS IF INSTALLED HORIZONTALLY
AT LESS THAN 45° TO HORIZONTAL.



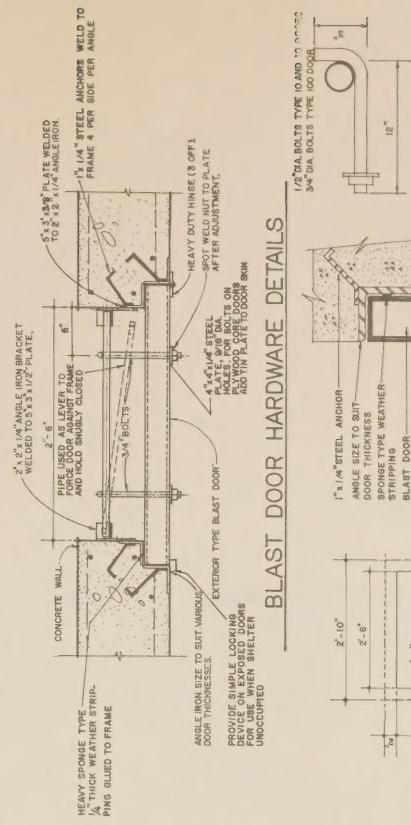
TYPICAL WATER STORAGE TANK

SCALE 1" = 1'-0"

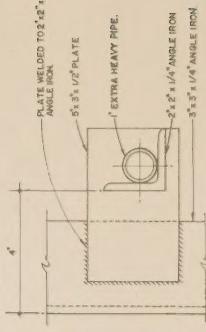
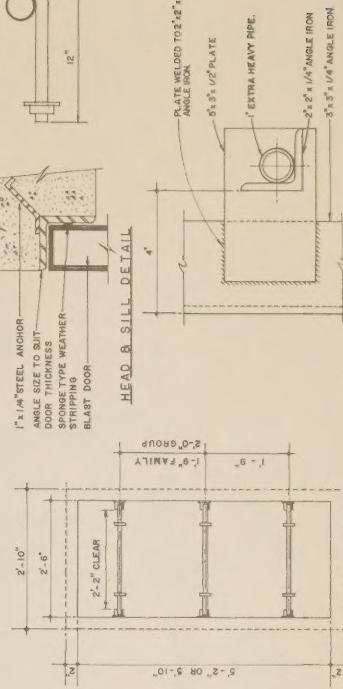


DETAIL OF SUMP

SCALE $\frac{1}{4}$ " = 1'-0"

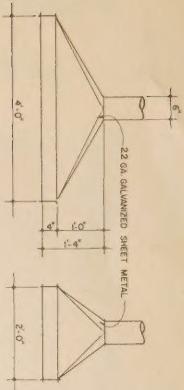


BLAST DOOR HARDWARE DETAILS

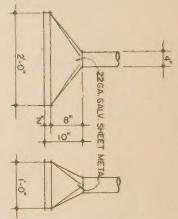


EXHAUST HOOD DETAILS

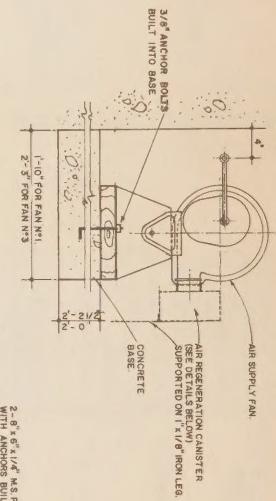
SCALE $\frac{3}{4}'' = 1'-0''$



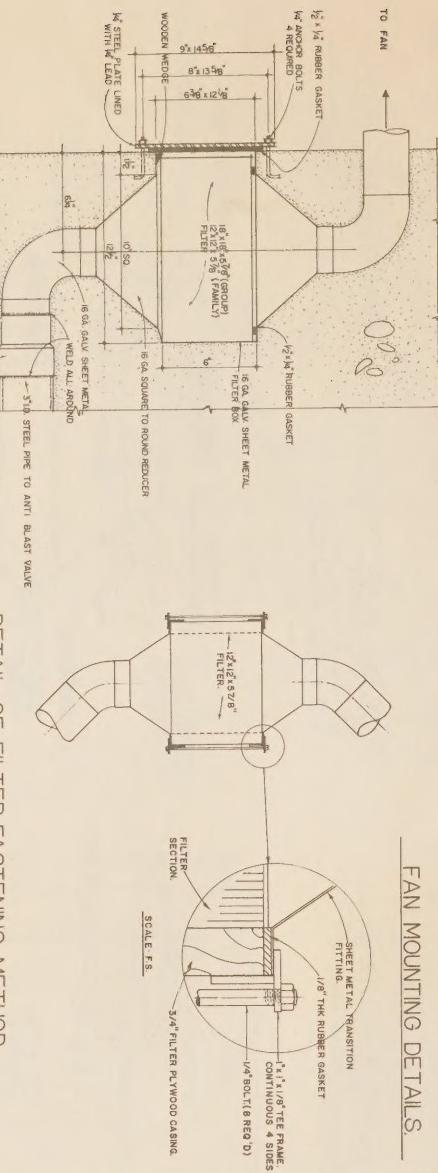
FAMILY SHELTERS



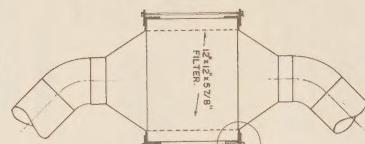
FAN MOUNTING DETAILS.



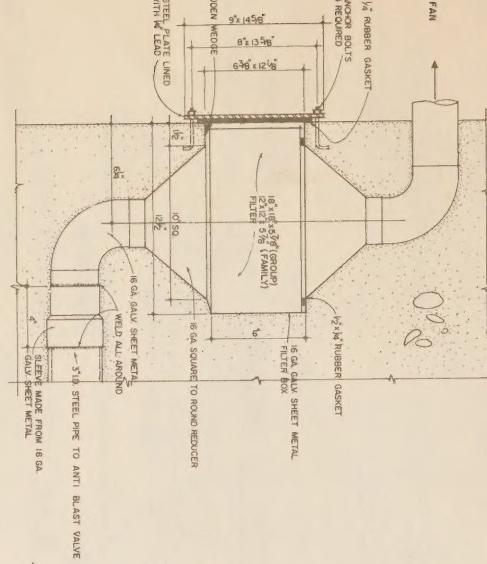
ESCAPE HATCH DOOR DETAILS.



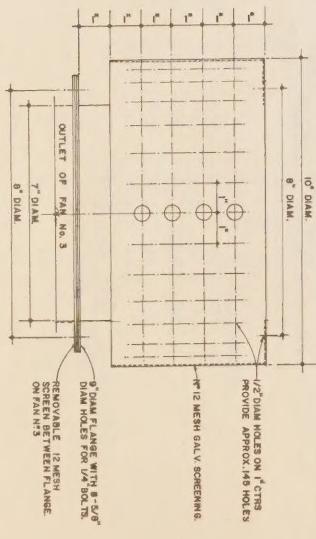
DETAIL OF FILTER FASTENING METHOD
IN ESCAPE HATCH



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DETAIL OF AIR REGENERATION CANISTERS.



BOTH CANISTERS TO BE OF
SOLDER JOINT CONSTRUCTION
AND 22 GA GALV SHEET METALL